Progress Energy

Serial: RNP-RA/04-0121

OCT 2 6 2004

United States Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555

H. B. ROBINSON STEAM ELECTRIC PLANT, UNIT NO. 2
DOCKET NO. 50-261/LICENSE NO. DPR-23

RESPONSE TO NRC REQUEST FOR ADDITIONAL INFORMATION REGARDING NRC BULLETIN 2003-01, "POTENTIAL IMPACT OF DEBRIS BLOCKAGE ON EMERGENCY SUMP RECIRCULATION AT PRESSURIZED-WATER REACTORS"

Ladies and Gentlemen:

On June 9, 2003, NRC Bulletin 2003-01, "Potential Impact of Debris Blockage on Emergency Sump Recirculation at Pressurized-Water Reactors," was issued requesting that licensees provide a response within 60 days. Progress Energy Carolinas, Inc. (PEC), also known as Carolina Power and Light Company, responded to NRC Bulletin 2003-01 in a letter dated August 8, 2003, for H. B. Robinson Steam Electric Plant, Unit No. 2. In a telephone call between the NRC and PEC on September 14, 2004, the NRC finalized a Request for Additional Information (RAI) to supplement the information PEC provided in the August 8, 2003 letter. During that call, the NRC requested that PEC provide a response within 60 days. Attachment II provides the required response to this RAI.

Attachment I provides an Affirmation in accordance with the provisions of Section 182a of the Atomic Energy Act of 1954, as amended, and 10 CFR 50.54(f).

If you have any questions concerning this matter, please contact Mr. C. T. Baucom at (843) 857-1253.

Sincerely,

Jan F. Lucas
Manager – Support Services – Nuclear

A103

Progress Energy Carolinas, Inc.
Robinson Nuclear Plant
3581 West Entrance Road
Hartsville, SC 29550

RAC/rac

Attachments:

I. Affirmation

II. Response to NRC Request for Additional Information Regarding NRC Bulletin 2003-01, "Potential Impact of Debris Blockage on Emergency Sump Recirculation at Pressurized-Water Reactors"

c: Dr. W. D. Travers, NRC, Region II
Mr. C. P. Patel, NRC, NRR
NRC Resident Inspector

AFFIRMATION

The information contained in letter RNP-RA/04-0121 is true and correct to the best of my information, knowledge and belief; and the sources of my information are officers, employees, contractors, and agents of Progress Energy Carolinas, Inc., also known as Carolina Power and Light Company. I declare under penalty of perjury that the foregoing is true and correct.

Executed On: 10-26-2004

William G. Noll
Director – Site Operations
HBRSEP, Unit No. 2

H. B. ROBINSON STEAM ELECTRIC PLANT, UNIT NO. 2

RESPONSE TO NRC REQUEST FOR ADDITIONAL INFORMATION REGARDING NRC BULLETIN 2003-01, "POTENTIAL IMPACT OF DEBRIS BLOCKAGE ON EMERGENCY SUMP RECIRCULATION AT PRESSURIZED-WATER REACTORS"

NRC Question 1

On pages 3 and 4 of Attachment II of your Bulletin 2003-01 response, you listed three actions that may be accomplished prior to indications of CV sump screen blockage, and five emergency procedure revisions to provide operators with procedural guidance relative to responding to a loss of Emergency Core Cooling System (ECCS) sump suction due to blockage. Both training and procedure changes for the three actions and five emergency procedure revisions were planned to be completed by November 14, 2003. However, your response does not completely discuss the operator training and procedural revisions to be implemented. Please provide a detailed discussion of the new actions actually implemented and operating procedures which were actually revised, with emphasis on the steps taken to avoid sump blockage conditions, the indications of sump clogging that the operators are instructed to monitor, and the response actions the operators are instructed to take in the event of sump clogging and loss of ECCS recirculation capability.

Response 1

Revisions were made to the following emergency procedures:

- EPP-9, "Transfer to Cold Leg Recirculation," Revision 28, was issued November 13, 2003
- EPP-10, "Transfer to Long Term Recirculation," Revision 17, was issued November 13, 2003
- EPP-Supplements, "Supplements," Revision 30, was issued November 13, 2003

These revisions incorporated actions to address the three strategies described as follows:

Steps taken to avoid sump blockage conditions:

1. EPP-9 was revised to start only one Safety Injection (SI) pump when switching to sump recirculation. This will reduce recirculation flow and reduce the potential for sump blockage.
2. EPP-10 was revised to start only one Residual Heat Removal (RHR) pump and one SI pump when switching to long term hot leg recirculation. This will reduce recirculation flow and reduce the potential for sump blockage.
3. EPP-10 was also revised to verify that the sump screen is clear prior to establishing the dual (hot and cold leg) injection mode. This will ensure reduced flow is maintained if sump blockage was noted to be a concern.

Steps for monitoring for the indication of sump blockage:

1. New steps were added to both EPP-9 and EPP-10 to diagnose for sump blockage. These steps require checking the RHR pump discharge pressure and flow for stable conditions. The absence of stable conditions could be an indication of pump cavitation, and hence potential sump blockage.
2. If indication of pump cavitation is present, the procedure directs the operator to perform the mitigating actions discussed below.

Steps to take in the event of sump blockage and loss of ECCS recirculation capability:

1. A new step was added to EPP-9 to commence makeup to the Refueling Water Storage Tank (RWST), and a new Supplement was added to the EPP-Supplements providing detailed instructions on how to add emergency make-up to the RWST. This action is performed regardless of whether or not sump blockage is occurring, and is necessary to ensure that RWST injection, as discussed below, is available as a mitigating action, if needed.
2. New steps were added to EPP-9 to stop the Containment Spray pump(s), if sump blockage is indicated and specified containment pressure conditions and cooling capabilities permit. This should improve the net positive suction head (NPSH) for the RHR and SI pumps.
3. A new step was added to EPP-9 to ensure the RHR and SI pumps are operating in the piggy-back mode if sump blockage is still indicated. The piggy-back mode results in reduced flow compared to the RHR pumps operating in the low pressure (non-piggy-back) mode, and hence should improve NPSH.
4. New steps were added to EPP-9 and EPP-10 to raise containment pressure by 2 psig, if sump blockage is still indicated and containment conditions permit. A new Supplement was added to the EPP-Supplements providing detailed instructions on how to raise containment pressure using the Station or Instrument Air Systems. This should improve NPSH for the recirculation pumps.
5. New steps were added to EPP-9 and EPP-10 to operate the SI and RHR pumps in an intermittent mode until pump distress is alleviated. The operating SI and RHR pumps are stopped and then restarted in the opposite train if both trains are available. This is done in six minute intervals.
6. New steps were added to EPP-9 and EPP-10 to realign the RWST to the injection mode, if makeup water has been added to the RWST as discussed above. This action provides additional core cooling and also adds water level to the containment sump to help with RHR pump NPSH.

Overview training related to the sump blockage issue and Bulletin 2003-01 was provided to licensed operators and was completed on August 27, 2003. Formal training on the revised procedures was provided to licensed operators and was completed on November 13, 2003. Both of these training sessions included classroom and simulator training, and included training on recognizing the indications of sump blockage.

NRC Question 2

On page 5 of Attachment II of your Bulletin 2003-01 response you state that "in the future, if changes to the WOG ERGs are received that provide guidance for the delay of switchover to recirculation, these changes will be reviewed for incorporation into the emergency operating procedures in accordance with the applicable process for such changes at HBRSEP, Unit No. 2." The Westinghouse Owner's Group (WOG) has developed operational guidance in response to Bulletin 2003-01 for Westinghouse and CE type pressurized water reactors (PWRs). Please provide a discussion of your plans to consider implementing this new WOG guidance. Include a discussion of the WOG recommended compensatory measures that have been or will be implemented at your plant, and the evaluations or analyses performed to determine which of the WOG recommended changes are acceptable at your plant. Provide technical justification for those WOG recommended compensatory measures not being implemented by your plant. Also include a detailed discussion of the procedures being modified, the operator training being implemented, and your schedule for implementing these compensatory measures.

Response 2

The following provides an analysis and conclusion related to implementation at H. B. Robinson Steam Electric Plant (HBRSEP), Unit No. 2, for each of the Candidate Operator Actions (COA) described in WCAP-16204, "Evaluation of Potential ERG and EPG Changes to Address NRC Bulletin 2003-01 Recommendations," as applicable to Westinghouse plants:

- COA-1A – Secure one Containment Spray pump before recirculation alignment.

  This COA is not being implemented at this time.

  The Loss of Coolant Accident (LOCA) dose analysis assumes continuous containment spray, except during the switchover from injection to recirculation mode. A reanalysis and potential licensing basis revision would be required to address spray flow interruption due to a single failure of the running Containment Spray pump.

  An evaluation of containment pressure and temperature would be required to show that they remain below the peak LOCA values and Equipment Qualification (EQ) curves during the time delay to start the secured Containment Spray pump, if the active pump is lost. This would require reevaluation of the LOCA containment model for some limiting case to bound the heat-up/pressure change caused by temporary loss of spray. Any increase in containment pressure would require revision to the licensing basis and the 10 CFR 50, Appendix J, testing program.

  As discussed in WCAP-16204, implementing this COA would provide the potential for a modest increase in the time to initiate containment recirculation during a small break LOCA, but would have a negligible impact on the plant response to a large break LOCA.

  The cost to perform the required analyses, along with the subsequent program and document changes, would result in a high cost with a minimal possibility of meeting LOCA dose acceptance criteria and would only benefit the small break LOCA condition. During a small

break LOCA, less debris is generated, ECCS sump flow rates are reduced, and the required NPSH is lower.

- COA-1B – Secure both Containment Spray pumps before recirculation alignment.

  This COA is not being implemented at this time.

  The discussion for COA-1A also applies to this COA. Additionally, this recommendation is intended for plants that do not use containment spray for sump pH control. HBRSEP, Unit No. 2, uses containment spray, along with the associated spray additive (NaOH), for sump pH control.

- COA-2 – Manually establish one train of containment sump recirculation prior to automatic recirculation switchover.

  This COA is not applicable to HBRSEP, Unit No. 2, as there is no automatic recirculation switchover capability.

- COA-3 – Terminate one train of SI after recirculation alignment.

  This COA has been implemented.

  As noted in the response to NRC Question 1, procedures have been revised to start only one train of SI during manual switchover to recirculation. Since HBRSEP, Unit No. 2, does not have automatic switchover capability, there would be no need to terminate one train after automatic initiation of two trains. The intent of this COA is met by manually starting only one train.

- COA-4 – Early termination of one RHR pump prior to recirculation alignment.

  This COA is not being implemented at this time.

  This action is inconsistent with the current LOCA thermal-hydraulic analysis. A no-flow condition, if the single remaining operating RHR pump were to fail, could result in core damage. Implementation of this COA would require reanalysis that is not likely to meet LOCA thermal-hydraulic acceptance criteria.

- COA-5 – Refill of the RWST.

  This COA has been implemented.

  As noted in the response to NRC Question 1, procedures have been revised to initiate refill of the RWST. Although WCAP-16204 recommends identifying alternate makeup sources, a team consisting of Operations, Training, and Engineering personnel could not identify any viable options for an alternate makeup source. The use of the Spent Fuel Pool as a makeup water source was considered, but ruled out due to the lack of Spent Fuel Pool water level

instrumentation. Therefore, the revised procedures discussed above rely on the normal RWST makeup for refill.

- COA-6 – Inject more than one RWST volume from a refilled RWST or by bypassing the RWST.

  This COA has been implemented.

  As noted in the response to NRC Question 1, procedures have been revised to realign the RWST to the injection mode, if makeup water has been added to the RWST. Since this results in conditions beyond the current design basis (e.g., flooding levels in the containment), this has been added as a last resort if sump recirculation has been lost and the other compensatory measures have been unsuccessful.

- COA-7 – More aggressive cooldown and depressurization guidance following a small break LOCA.

  The current emergency procedures already address maximizing cooldown rate up to the Technical Specifications limit.

- COA-8 – Provide guidance on symptoms and identification of containment sump blockage.

  This COA has been implemented.

  As noted in the response to NRC Question 1, procedures have been revised to include diagnosis of sump blockage.

- COA-9 – Develop contingency actions in response to containment sump blockage, loss of suction, and cavitation.

  This COA includes a subset of eight potential actions, as follows:

  1. Stop pumps experiencing loss of suction to prevent permanent pump damage. This action is already included within the emergency procedures.
  2. Reduce recirculation flow to the minimum required to support design basis or critical safety functions. This action is already included within the emergency procedures.
  3. Verify containment cooling unit operation to minimize cooling demand for containment spray flow. This action is already included within the emergency procedures.
  4. Establish alternate water sources to inject into the reactor core and spray into the containment. This action has been added to the emergency procedures, but only as a last resort if recirculation from the sump is lost.
  5. Optimize use of available sources of flow for injection into the reactor core and spray into the containment. This action is already included within the emergency procedures.
  6. Cooldown and depressurize the reactor coolant system (RCS) using the secondary system to reduce required injection flow to the RCS and allow placing the RHR system in service. This action is already included within the emergency procedures.

7. Backflush the recirculation flow path to remove blocking material from the sump screens. This action cannot be implemented without a piping modification, and hence is not being implemented at this time.
8. Vent pumps that have become air-bound. This action was not incorporated into the emergency procedures based on consideration of potentially high operator doses required to perform the activity and the low probability of air introduction into the RHR pumps. However, an existing normal operating procedure, OP-201, "Residual Heat Removal System," includes the necessary steps to vent the RHR pumps, and the Emergency Response Organization could recommend such a mitigating strategy if the conditions dictate and radiological conditions allow the task to be performed.

- COA-10 – Early termination of one train of high head injection prior to recirculation alignment.

  This COA is not being implemented at this time.

  This action is inconsistent with the current LOCA thermal-hydraulic analysis. A no-flow condition, if the single remaining operating SI pump were to fail, could result in core damage. Implementation of this COA would require reanalysis that is not likely to meet LOCA thermal-hydraulic acceptance criteria.

- COA-11 – Prevent or delay Containment Spray for small break LOCAs in ice condenser plants.

  This COA is not applicable, as HBRSEP, Unit No. 2, is not an ice condenser plant.

Based on the above discussion of each COA, the COAs have either already been incorporated into the procedures and training, are not applicable, or are not being implemented as an interim compensatory measure. There are no additional actions planned in regard to Bulletin 2003-01.

NRC Question 3

NRC Bulletin 2003-01 provides possible interim compensatory measures licensees could consider to reduce risks associated with sump clogging. In addition to those compensatory measures listed in Bulletin 2003-01, licensees may also consider implementing unique or plant-specific compensatory measures, as applicable. Please discuss any possible unique or plant-specific compensatory measures you considered for implementation at your plant. Include a basis for rejecting any of these additional considered measures.

Response 3

The HBRSEP, Unit No. 2, response to NRC Bulletin 2003-01, dated August 8, 2003, provided an evaluation and an implementation schedule for six possible interim compensatory measures intended to reduce the risk that may be associated with potentially degraded or nonconforming ECCS and Containment Spray System (CSS) recirculation functions. Those six interim compensatory measures are summarized as follows:

- Operator training on indications of and responses to sump clogging
- Procedural modifications, if appropriate, that would delay the switchover to containment sump recirculation
- Ensuring that alternative water sources are available to refill the RWST or to otherwise provide inventory to inject into the reactor core and spray into the containment atmosphere
- More aggressive containment cleaning and increased foreign material controls
- Ensuring containment drainage paths are unblocked
- Ensuring sump screens are free of adverse gaps and breaches

HBRSEP, Unit No. 2, did not consider for implementation any possible unique or plant-specific interim compensatory measures beyond those described above.